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The following statement is a full description of this invention, including the best method of performing it known to us :

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38,629/72

SPECIFICATION

(Docket No. VG-92)

HIGH VISCOSITY PHOTOGRAPHIC COMPOSITIONS AND PROCESS FOR PREPARING SAME

ABSTRACT OF THE DISCLOSURE

The viscosity and shelf life of photographic solutions are increased by adding thereto from about 0.2% to about 0.5% by weight of certain thickeners such as non-ionic polysaccharides, in particular, guar gum, and carrageenin or mixtures of these. The specific viscosities are in the range of about 10 to about 100 cps, with the range of about 10-20 cps being preferred. Optionally, surface active agents may also be added to the solutions. It is possible to pump solutions thus thickened with low speed, non-vibratory pumping devices thereby avoiding the transmission of vibrations to delicate photographic imaging equipment.

BACKGROUND OF THE INVENTION

This invention relates to photographic solutions which are particularly useful in phototypographic equipment owing to their increased viscosity.

Phototypographic equipment has been known for some time and examples thereof are described in U.S. Patent Nos. 3,115,815 and 3,080,802. The photographic solutions conventionally used with this type of equipment have relatively low viscosities. To deliver these solutions to the equipment's imaging area by pumping requires high speed pumping devices of around 1000 rpm., which, because of their speeds, produce considerable vibration. Such vibration transmitted through the phototypographic device can reduce the sharpness, alignment and stability of the produced images.

One approach which has been suggested and tried in order to make possible the use of low speed, substantially vibratory-free pumping devices to deliver photographic solutions has consisted in increasing the viscosity of such solutions. This viscosity increase has been effected through the addition of thickeners such as gelatin, agar, and polyvinyl alcohol. Such prior art solutions, however, produce compositions which had a decreased shelf life, resulted in the formation of colored reaction products, and changed the photographic properties of the solutions.

SUMMARY OF THE INVENTION

The present invention has for its main object to provide stable photographic solutions which are sufficiently viscous to be pumped by low speed pumping devices.

An equally important object of the present invention is to provide viscous photographic solutions characterized by an increased shelf life owing to the incorporation therein of certain chemically compatible thickeners.

It is another object of the present invention to provide improved methods for preparing thickener and photographic solutions.

A further feature of the invention is the use, in the solution hereinabove described, of at least one surface active agent.

A further aspect of the invention provides improved methods for preparing thickener and photographic solutions.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

As used herein, the expression, "photographic solution" will be understood to include developer, short stop and fixer solutions.

The thickeners which are suitable for the purposes of this invention must be compatible with the active ingredients of both photographic solutions/of the oxidizing and reducing types. More specifically, these thickeners must be non-ionic, non-gelling and stable over a pH range of about 2 to 14. Such thickeners include non-ionic poly-saccharides, in particular, guar gum,

carrageenin and mixtures thereof. These gums are used because they do not deteriorate appreciably and do not produce colored or turbid solutions. In the practise of the invention, clear aqueous gum solution is preferably prepared by hydration and then solution, and the active photographic ingredients are then added to an aliquot portion or unit amount of the gum solution. Enough thickener should be present to give a solution having a viscosity in the range of about 10 to 100 cps, with the range of 10 to 20 cps being preferred. Generally the thickeners employed to make the gum solution will constitute from about 0.2% to about 0.5% of the final photographic solution, the preferred amount being about 0.3%.

The use of from 0.2% to about 0.5% of the gum weight of a surface active agent in the practise of the invention has been found to give best results. Practically any commercially available surface active agent may be used in the solutions of the invention as long as it does not react with the active photographic ingredients. Suitable surface active agents include aliphatic and olefinic alcohols and esters. Preferred among these are ethyl alcohol and dioctyl sodium sulfocuccinate. The presence of surface active agents in the final solutions ensures their homogeneity and facilitates pumping.

Three methods have been found particularly advantageous in the preparation of the gum or thickener solution In the first, the thickener in finely divided form is dusted onto the surface of vigorously agitated water. In this connection, it has been noted that it is preferable to use

deionized or distilled water inst ad of tap water. The solution is maintained under agitation until hydration is complete by means, for example, of a high speed agitator rotating at 1500 rpms

In the second method, a slurry of the thickener with a liquid surface active agent such as ethyl or isopropyl alcohol is first prepared and then a large amount of water is added to the slurry. The resulting solution is then maintained under continuous mild agitation until hydration is complete. In the third method, the thickener or gum is spray-coated with a solution of a surface active agent such as dioctyl sodium sulfosuccinate. The thus treated gum is then added to a much larger quantity of water maintained under mild agitation.

Once the thickener solution has been made, the usual amounts of active photographic indredients are added thereto with mild agitation. Where needed, the solution can be heated to accelerate the rate of solution of certain of these ingredients such as sodium thiosulfate.

The following examples are given to illustrate the present invention. It is not intended to limit the invention to the particular methods employed, the concentration of materials used or to the specific conditions described in presenting thes examples.

EXAMPLE I

Three grams of guar gum were dusted onto the surface of 1000 cc of vigorously agitated water. The agitation was maintained until hydration was complete by the use of a high speed agitator operated at 1500 rpms.

EXAMPLE II

A slurry was prepared by mixing 3 grams of guar gum with 30 cc of isopropyl alcohol. Then 1000 cc of water was added rapidly to the slurry and the solution was maintained under continuous mild agitation until hydration was complete.

EXAMPLE III

Three grams of guar were spray-coated with a 25% aqueous solution of dioctyl sodium sulfosuccinate containing 9mg of the sulfosuccinate. The thus treated gum was then added to 1000 cc of water under mild agitation.

EXAMPLE IV

A developer solution was prepared by adding 100g of sodium sulfite, 30 g of hydroquinone, 25 g of sodium hydroxide, 20 g of potassium bromide to 1000 cc of solution prepared by anyone of Examples 1-3. After agitating gently until all the materials dissolved, the solution was ready for use. Its viscosity was about 10 centipoises.

EXAMPLE V

A short-stop or stop-bath solution was prepared by adding 60 cc of 50% acetic acid and 3.5 g of sodium sulfite to 1000 cc of gum solution prepared by any one of Examples 1-3 using mild agitation until all the solids dissolved. The solution was readily pumped by a rotary pump.

EXAMPLE VI

A fixer solution was prepared by heating 1000 cc of a gum solution as above prepared in Example I to 180°F under mild agitation. Next 225 g of sodium thiosulfate were added and stirred thereafter until they dissolved. The fixer solution thus obtained was readily pumped by a gear pump.

EXAMPLE VIII

By following essentially the proceduresof Examples I and IV, a developer solution containing carrageenin gum as th thickener is prepared.

EXAMPLE VIII

By following essentially the procedures of Examples III and IV, but using carrageenin as the thickener, there is obtained a short stop solution of suitable viscosity.

EXAMPLE IX

By following essentially the procedures of Examples II and VI, but using carrageenin as the thickener, there is obtained a fixer solution of suitable viscosity.

The shelf life of the solutions made in accordance with the present invention is substantially longer than that made with other gums being on the order of about one year instead of about one month.

The foregoing examples and specification clearly indicate the method by which the process of the invention increases the viscosity of photographic solutions. The benefits afforded photographic operations and techniques will be readily ascertained by those skilled in the art relating thereto.

The claims defining the invention are as follows:

1. Process for increasing the viscosity of photographic solutions which compris s adding to said solutions effective amounts of at least one non-ionic, non-hydrolyzable thickener sufficient to render said solutions pumpable to an imaging area by low speed pumping devices.

2. The process according to claim 1 wherein effective amounts of at least one compatible surface active agent are also incorporated in said solutions.

3. The process according to claim 1 wherein a thickener solution is first prepared by dusting said thickener over a volume of water maintained under vigorous agitation, the active photographic ingredient being then added to the thus formed thickener solution.

4. The process according to claim 1 wherein a thickener solution is first prepared by spray coating the thickener with a solution of a compatible surface active agent and dissolving the spray-coated thickener in water.

5. The process according to claim 4 wherein said thickener is guar gum and said surface active agent is dioctyl sodium sulfosuccinate.

6. The process according to claim 1 wherein the amount of thickener used ranges from 0.2% to 0.5% by weight of said solutions.

7. The process according to claim 1 wherein said thickener is selected from the group consisting of guar gum, carrageenin and mixtures thereof.

8. The process according to claim 2 wherein said surface active agent is selected from the group consisting of ethyl alcohol, isopropyl alcohol, and dioctyl sodium sulfosuccinate.

9. A photographic solution containing active photographic agents; from about 0.2 to 0.5 percent by weight of a non-ionic non-hydrolyzable thickener and from 0 to about 0.5 percent by weight of said thickener of a surface active agent.

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